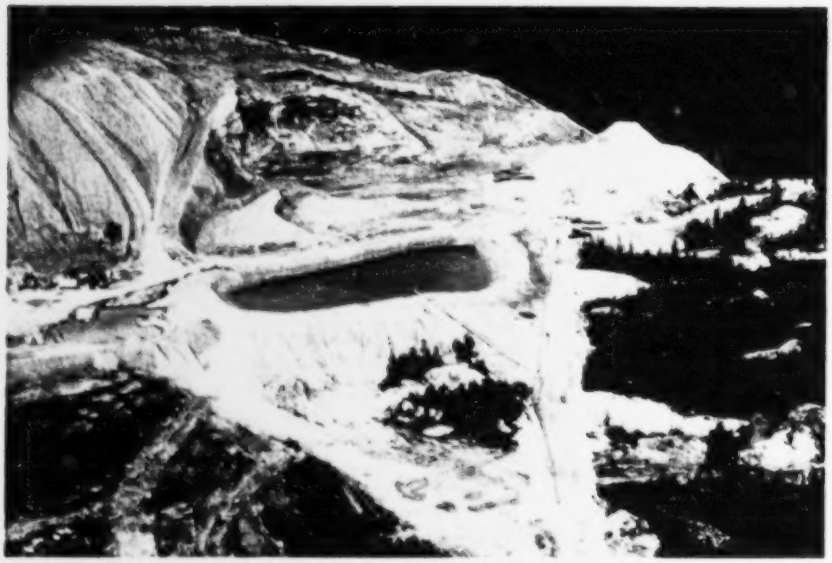
FISH HABITAT AND MINING

Fish habitat means spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes... No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat, unless authorized by the Minister of Fisheries and Oceans.

Fisheries Act, Sections 34 and 35



Mining operation with tailings settling pond

Introduction

Canada's natural resources are of major importance not only to the country's economy but to its people everywhere. Many of our smaller towns and cities could not exist without a mine, a fish plant or a paper mill. The conservation and wise use of all our natural resources, both renewable and non-renewable, is therefore of major importance.

Canadians are well aware of the importance of wise use of non-renewable resources, such as minerals and oil, so that future generations may continue to benefit from these important reserves. Similarly, our renewable resources such as fisheries and forests, must be managed and protected sensibly if they are to endure. In particular, this requires that we pay careful attention to the habitats that support these renewable resources.

The approach of Fisheries and Oceans is that no one resource should take precedence over another. From the fisheries resource viewpoint, an integrated approach to the management of all of Canada's natural resources is desirable. This requires ongoing cooperation between fisheries managers and managers in other resource and industrial sectors.

This publication describes the desirable relationship between fish habitat management and Canada's mining industry. In addition, the publication outlines the potential hazards to fish and fish habitat that may be caused by mining activities, and it stresses the measures that can be taken to avoid or correct problems so that operating mines can achieve compliance with Canada's strict fish habitat protection laws.

Fish are a traditionally valuable resource and fishing is a way of life for many Canadians. Commercial and sport fisheries contribute more than $7 billion annually to the national economy in 1989 dollars and fish is a staple food and an important cultural element for many native communities. This important resource must be preserved and enhanced for future generations.

Mining and associated industries are primary contributors to the country's gross national product.

Mining and Fisheries Interests

There are examples to show that mining and fisheries interests can be compatible and the two resource sectors can coexist. The mining industry can manage and control its activities to minimize the impact on fishery resources. Wisely planned

River bank restoration

and operated mining activity can proceed without any loss of the productive capacity of fish habitat. Cooperative efforts to manage mineral and fishery resources have occurred. Three of those examples follow:

1 - The developers of gold mines in the Hemlo area of northern Ontario wanted to use nearby Molson Lake for the discharge of mine wastes (tailings). The mine developers, working in conjunction with the Ontario Ministry of Natural Resources and the Department of Fisheries and Oceans, determined that no important fishery existed in the lake, that the local public had no opposition to the proposed use of Molson Lake and that the company's plans were adequate for protection of valuable fisheries downstream of the lake. The Minister of Fisheries and Oceans subsequently isssued a legal authorization for the mine to use the lake as a tailings impoundment. Decisions to use natural water bodies or parts of Canada's oceans for such purposes are dependant on their importance to the fisheries resource and the adequacy of plans to protect downstream fisheries.

2 - The Noranda Research Centre has been active in the Rouyn-Noranda area of Quebec in restoring fish habitat, especially water quality, after years of intensive mining activity around Lake Dufault had led to degradation. These developments were originally approved long before environmental protection had become a concern of Canadian society. Following the opening of a water treatment plant in 1985, and a subsequent improvement in water quality, a program was undertaken with the Quebec Fish and game Department to restore the walleye population of the lake.

3 - In 1985 the Noranda Research Centre, the Department of Fisheries and Oceans, Brunswick Mining and the Nepisiquit Salmon Association began field testing a streamside salmon incubation technique on the Papineau River in New Brunswick to evaluate its feasibility for use by Fisheries and Oceans and public groups in Atlantic salmon enhancement programs. This river is a naturally productive, unimpaired salmon stream, tributary to the Nepisiquit River, where Noranda has active mines. Starting with salmon eggs from Nepisiquit River fish, the incubation experiment has added over 75,000 juvenile salmon to the Papineau River.

Meaningful cooperation during both the development and operation of mines in Canada is highly dependent on positive attitudes on the part of both the mining industry and fisheries agency personnel. Government and industry leaders have given strong encouragement to an improved dialogue among officials by approving new mine development review mechanisms in recent years. Voluntary research programs by the mining industry into improved methods of mine waste treatment also transmit a signal that the industry is striving toward better environmental management.

A word about mining

Water is a key part of any mining venture, from placer mining in streams, to seabed mining in our marine coastal waters, to underground and open pit mines. The last mentioned type, called hardrock mining, is the most common in Canada and it is described in more detail in the following paragraph.

In hardrock mining, ores are first mined, crushed, ground-up and then concentrated in mills. These operations use large amounts of water, first of all for drilling, then in the mill itself. The milling process separates the desired metal from massive amounts of waste material using a large amount of water for grinding and concentrating the desired metals. In addition, depending on the process being used, chemicals may be added during the milling process. Tailings, a waste mixture of water, chemicals and finely pulverized rock, usually contain traces of metals. The refining industry also has the potential to release harmful chemicals and waste materials into fish habitat. All of these activities must be properly managed and controlled to protect Canada's fish habitat and fisheries resources.

Chemical impact

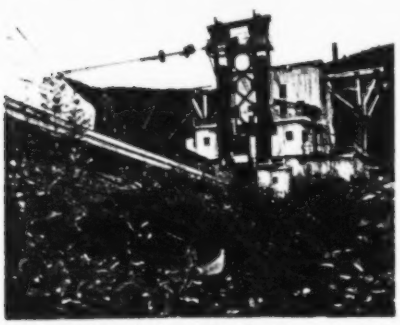
If not properly treated, tailings and harmful chemical wastes from milling and refining operations can pollute water, kill fish and damage fish habitat. Low concentrations of such contaminants can cause damage to respiratory or reproductive organs and can contaminate fish flesh.

The direct discharge of untreated nitrates and ammonia into fish habitats can cause a number of problems including the immediate mortality of fish and the prolific growth of aquatic vegetation, which leads to reduced oxygen levels that can be lethal to fish.

Sulphur dioxide and nitric oxide emissions from metal smelters can be carried long distances by wind currents. When these gases mix with water vapour, they form sulphuric and nitric acid and fall to earth as acid rain. Increased acidity of natural waters can result in fish failing to reproduce, or if they are successful, their offspring may be deformed.

Oxidation in tailings and waste rock piles may also generate acidic water which can enter fish habitat if not properly controlled. This serious problem, called acid mine drainage, is difficult to predict and demands serious attention if it is to be prevented.

Discharges of untreated sewage, and spills of fuel and lubricants used in mining machinery can damage or destroy fish and fish habitat. Sublethal concentrations can either contaminate fish or result in respiratory or reproductive damage.



Old gold mining dredge

Measures to avoid chemical impacts

Provincial and federal regulatory agencies and mining corporations are acting to reduce the number and severity of harmful impacts on fish and fish habitat from mining operations.

Tailings, toxic chemicals and other contaminants used at mining sites may be controlled by the proper use of well-designed treatment and storage facilities that prevent settable solids and heavy metals from entering fish habitat.

At mineral refining sites, preventing the spread of fisheries problems arising from deposition of acid rain and snow can be achieved by a reduction of concentrations of sulphur dioxide and nitric oxide in air emissions.

Physical impacts

Fish and fish habitat can be physically damaged or destroyed if waste rock, particulate material, sand or gravel is dumped or washed into streams.

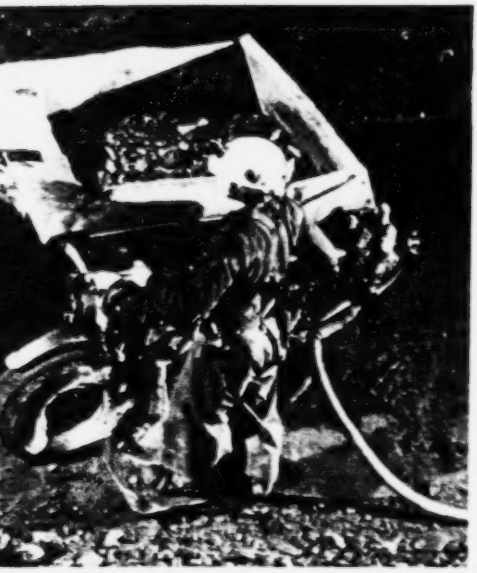
In mining, the removal of vegetation and soil overburden is often necessary to gain access to metal or coal deposits; topsoil and foliage can then wash into the river and blanket stream beds or obstruct stream courses. When major amounts of streamside cover are lost, increases in water temperature can result. This in turn can affect the survival of fish and the organisms on which they feed. Nutrients and food sources, in the form of leaf litter and insects, will be lost if the steamside cover is removed. Likewise, the protection from predators which streamside cover can provide will also be lost.

Front-end loader picking ore after blast

Siltation from the erosion of stream banks, mined areas or tailings piles as a result of mining itself or associated road and railway-spur construction can seriously impair local fish habitat and block essential supplies of oxygen and clean water to incubating eggs and food organisms. Where roads or railways actually cross rivers and streams, extreme care must be taken to avoid short-term impacts and the destruction of fish habitat.

Measures to Avoid Physical impacts

Where mining must be conducted in the vicinity of fish habitat that supports important fisheries resources, mining and fisheries officials should consult at an early stage to consider the measures that may be needed to protect the habitat. Tailings can be isolated from fish habitat at properly managed disposal sites. In rare



cases, rivers or streams may have to be diverted to accommodate the placement of tailings ponds. Any such proposed diversions would require careful review in accordance with the no net loss working principle of the habitat management policy (see next section). Streamside cover, which plays a major role in providing essential habitat features for the growth and survival of fish, can be preserved or replaced. Disturbed slopes can be stabilized to reduce erosion effects.

Where bridges, roads and railway spurs are needed, erosion can be minimized by using appropriate crossing designs and by proper construction methods. Culverts must be properly designed and installed to accommodate fish migration and water flows.

The role of the Department of Fisheries and Oceans

The objective of the Department of Fisheries and Oceans' policy for the management of fish habitat is to achieve a NET GAIN in Canada's fisheries resources by conserving, restoring and developing fish habitat for the benefit of present and future generations. To achieve this, strict controls on activities and substances that threaten fish and fish habitat are necessary.

Canada's Fisheries Act provides the Minister of Fisheries and Oceans with the authority to protect fish and fish habitat in freshwater and in the oceans off our coasts.

The Department's role includes regulation, inspection, enforcement and monitoring. Continuing research is necessary to increase our understanding of the importance of fish habitat and the effects of activities that may alter or destroy it. In meeting its goal of conserving fish habitat, the Department applies the working principle of NO NET LOSS to new works and undertakings to ensure that the productive capacity of habitat is maintained. The Department will require mines, in sensitive locations, to meet specific conditions that protect fish habitat. In addition, efforts are made to restore habitat previously altered or destroyed and to develop new habitat to achieve a NET GAIN of habitat for selected fisheries.

New and certain existing base metal mines and any future amendments to control discharges of heavy metals and suspended solids must comply with the Metal Mining Liquid Effluent Regulations promulgated

Aerial view of open-pit mine

under the **Fisheries Act** and administered under Section 36 of the **Act** by Environment Canada.

Early consultation and planning between mining companies and fish habitat management officials is important to ensure that mining developments proceed in an environmentally acceptable manner. Public information and consultation programs may be carried out to review and discuss proposed mining developments. In this way, public interests can be made known and considered when decisions are made by government agencies.

This brochure is one in a series prepared by the Department of Fisheries and Oceans to inform the public and interested parties about the impact of various human activities on Canada's fish habitat.

Others in this series:

Fish Habitat and Forestry
Fish Habitat and Dredging

Other habitat management leaflets available on request:

Fish Habitat, The Foundation of Canada's Fisheries
Fish Habitat, Conserving Our Hidden Assets
Canada's Fish Habitat Law
Offshore Oil and Gas and Canada's East Coast Fisheries
Policy for the Management of Fish Habitat
Summary, Fish Habitat Management Policy

Large culverts permit road construction and fish movement

For further information about fish habitat protection, please contact these departmental offices:

Federal Fisheries Contacts

Director General
Habitat Management and
Sustainable Development
Fisheries and Oceans
200 Kent Street
Ottawa, Ontario
K1A 0E6
Telephone: (613) 990-0007

Regional Director General
Pacific Region
Fisheries and Oceans
555 West Hastings Street
Vancouver, British Columbia
V6B 5G3
Telephone: (604) 666-6098

Regional Director General
Central and Arctic Region
Fisheries and Oceans
501 University Crescent
Winnipeg, Manitoba
R3T 2N6
Telephone: (204) 983-5117

Regional Director General
Quebec Region
Fisheries and Oceans
P.O. Box 15500
901 Cap Diamant
Quebec City, Quebec
G1K 7Y7
Telephone: (418) 648-4014

Regional Director General
Gulf Region
Fisheries and Oceans
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6
Telephone: (506) 851-7750

A productive river

Regional Director General
Scotia-Fundy Region
Fisheries and Oceans
P.O. Box 550
Halifax, Nova Scotia
B3J 2S7
Telephone: (902) 426-2581

Regional Director General
Newfoundland Region
Fisheries and Oceans
P.O. Box 5667
St. John's, Newfoundland
A1C 5X1
Telephone: (709) 772-4417

Provincial Fisheries Contacts:

In Alberta, Saskatchewan, Manitoba, Ontario and the inland waters of Quebec, where the federal **Fisheries Act** is administered by the provincial government, contact the appropriate provincial fisheries management agency.

In British Columbia, in areas which support purely freshwater fish species, contact the provincial Department of Environment.

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